WHAT IS CLAIMED:

1. Apparatus for electrochemically etching grooves in a surface of a conical bearing to be utilized in a fluid dynamic bearing, comprising a frame for holding the cone about an axis and facing a movable electrode movable along the axis, the electrode being axially movable and having a surface carrying a groove pattern to fix on an inner surface of the cone,

a source of electrolyte to be pumped at a fixed static pressure rate between the surface of the movable electrode and the inner surface of the cone,

and a static fixture for supporting the electrode for movement toward and away from the inner surface of the cone with minimal frictional restriction, and a force biasing the electrode surface toward the inner surface of the cone so that the gap through which the electrode flows between the inner surface of the cone and the surface of the electrode is determined primarily by the static flow rate of the electrolyte and the force bias of the electrode toward the inner surface of the cone.

2. Apparatus claimed in claim 1 wherein the static frame comprises an aerostatic slide, the electrode moving along the axis toward and away from the inner surface of the cone supported primarily by an air bearing in the gap between the static frame and a dynamic element supporting the electrode.

3. Apparatus as claimed in claim 1 wherein the electrode is a conical electrode and comprises a groove pattern on an outer surface thereof, the grooves to be formed in the surface of the conical bearing being defined by the groove pattern.

4. Apparatus as claimed in claim 1 wherein the bias of the dynamic element and electrode toward the conical surface is established by pressure against a distal end of the dynamic element.

5. Apparatus as claimed in claim 4 wherein the pressure is defined by air pressure contained with a cell enclosing at least the distal end of the dynamic element.

6. A device is claimed in claim 4 further comprising a source of electrical potential to be applied to the workpiece and electrode respectively, the electrical potential creating a fixed current rate across the gap so that a rate at which an ECM process is carried out is determined primarily by the gap between the electrode surface and the inner surface of the cone.

7. Apparatus' claimed in claim 3 wherein the radial clearance between the dynamic slide and the static frame is about 0.002 to 0.003 mm.

8. Apparatus' claimed in claim 7 comprising a source of air pressure applied to the distal end of the dynamic slide which is also the source of air pressure which supports the dynamic element for movement radially through the static element, the air pressure thereby making the aerostatic slide self-sealing to keep the ECM electrolyte out of critical areas in the electro-static slide.

9. Apparatus' claimed in claim 8 wherein the air pressure in the gap between the dynamic element and the static element is sufficiently high to provide a high force forces displayment ratio in the x and y axes relative to the axis along which the dynamic element is moving so that the working surface electrode surface of the slide remains accurately aligned relative to the surface to be grooved.

10. Apparatus for electrochemically etching grooves in a surface of a conical work piece comprising

means for fixedly supporting the work piece in the apparatus; and

means for biasing an electrode bearing a groove pattern to be etched in the work piece along an axis and across a gap from the conical surface of the work piece, and means for supplying electrolyte to the gap.

11. Apparatus as claimed in claim 9 wherein the means for supplying electrolyte to the gap cooperate with the means for biasing the electrode to thereby set the gap.

12. Apparatus a claimed in claim 11 wherein the means for fixedly supporting the workpiece comprises a frame for holding the workpiece about an axis and facing a movable electrode movable along the axis, the electrode being axially movable and having a surface carrying a groove pattern to fix on an inner surface of the workpiece.

13. Apparatus as claimed in claim 11 wherein the means for applying electrolyte comprise a source of electrolyte to be pumped at a fixed static pressure rate between the surface of the movable electrode and the inner surface of the cone,

14. Apparatus as claimed in claim 11 wherein the means for biasing the electrode comprise a static fixture for supporting the electrode for movement toward and away from the inner surface of the cone with minimal frictional restriction, and a pressure source biasing the electrode surface toward the inner surface of the cone so that the gap through which the electrode flows between the inner surface of the cone and the surface of the electrode is determined primarily by the static flow of the electrolyte and the force bias of the electrode toward the inner surface of the cone.

15. Apparatus a claimed in claim 14 wherein the means for fixedly supporting the workpiece comprises a static frame for holding the workpiece about an axis and facing a movable electrode movable along the axis, the electrode being axially movable and having a surface carrying a groove pattern to fix on an inner surface of the workpiece.

16. A method for electrochemically etching grooves in a surface of a conical bearing to be utilized in a fluid dynamic bearing, comprising a frame for holding the cone about an axis and facing a movable electrode movable along the axis, the electrode being axially movable and having a surface carrying a groove pattern to fix on an inner surface of the cone,

pumping electrolyte at a fixed static pressure rate between the surface of the movable electrode and the inner surface of the cone, and

supporting the electrode for movement toward and away from the inner surface of the cone with minimal frictional restriction, and biasing the electrode surface toward the inner surface of the cone so that the gap through which the electrode flows between the inner surface of the cone and the surface of the electrode is determined primarily by the static flow rate of the electrolyte and the force bias of the electrode toward the inner surface of the cone.

17. A method as claimed in claim 16 wherein the static frame comprises an aerostatic slide, the method including the step of moving the electrode along the axis toward and away from the inner surface of the cone supported primarily by an air bearing in the gap between the static frame and a dynamic element supporting the electrode.

18. A method as claimed in claim 17 wherein the electrode is a conical electrode and comprises a groove pattern on an outer surface thereof, the method including forming the grooves on the surface of the conical bearing as defined by the groove pattern, the method further providing an electrical potential applied to the workpiece and electrode respectively, the electrical potential creating a fixed current rate across the gap so that a rate at which an ECM process is carried out is determined primarily by the gap between the electrode surface and he inner surface of the cone.

19. A method as claimed in claim 18 including the step of establishing the bias of the dynamic element and electrode toward the conical surface by air pressure against a distal end of the dynamic element.

20. A method as claimed in claim 19 wherein the air pressure established in the gap between the dynamic element and the static element sufficiently high to provide a high force displayment ratio in the x and y axes relative to the axis along which the dynamic element is moving so that the working surface electrode surface of the slide remains accurately aligned relative to the surface to be grooved.